Exemption No. 7296

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056

In the matter of the petition of **Galaxy Aerospace Company and NORDAM Group** For an exemption from § 25.785(b) of Title 14, Code of Federal Aviation Regulations	**Regulatory Docket No. 30056**

PARTIAL GRANT OF EXEMPTION

By letter dated March 17, 2000, Peter C. T. Hoi, Director of Engineering, Galaxy Aerospace Company, LP, One Galaxy Way, Alliance Airport, Fort Worth, Texas 76177, petitioned the Federal Aviation Administration on behalf of Galaxy Aerospace Company and NORDAM Group, for an exemption from § 25.785(b) Title 14 Code of Federal Regulations (14 CFR). The proposed exemption, if granted, would permit relief from the general occupant protection requirements for multiple place side-facing seats on Israel Aircraft Industries Galaxy (A53NM) model airplanes.

The petitioner requests relief from the following regulation:

> Section 25.785(b), Amendment 25-64, requirements for general occupant protection for occupants of multiple place side-facing seats that are occupied during takeoff and landing.

ANM-00-463-E

The petitioner's supportive information is as follows:

"PETITION:

"Galaxy Aerospace Company, LP and the NORDAM Group hereby petition for exemption from the following Federal Aviation Regulations to permit the installation of side-facing seats manufactured by ERDA, Inc. in any Israel Aircraft Industries Galaxy (A53NM) model aircraft.

"Request for exemption from:

"FAR [Federal Aviation Regulation] Section 25.785(b), requirement for general occupant protection for occupant of multiple place side-facing seats that are occupied during takeoff and landing.

"FAR Section 11.25(b)(1), requirement to submit the petition at least 120 days before the proposed effective date of exemption.

"REFERENCES:

"FAA Exemption No. 7120, issued on 15 February 2000
"FAA Exemption No. 7104, issued on 18 January 2000
"FAA Memorandum "Side-Facing Seat on Transport Category Airplanes," dated 19 November, 1997
"FAA "Draft Issue Paper," dated 12 November 1997

"BACKGROUND:

"Part 25 of the Federal Aviation Regulations (FAR) was amended June 16, 1988, by Amendment 25-64, to revise the emergency landing conditions that must be considered in the design of the airplane. Amendment 25-64 revised the static load conditions in §25.561, and added a new §25.562 that required dynamic testing for all seats approved for occupancy during takeoff and landing. The intent of Amendment 25-64 is to provide an improved level of safety for occupants on transport category airplanes. Because most seating is forward facing on transport category airplanes, the pass/fail criteria developed in Amendment 25-64 focused primarily on these forward facing seats. The side-facing seat installations were not adequately taken into account for transport category airplanes when Amendment 25-64 was promulgated.

"However, FAA Memorandum 'Side-Facing Seat on Transport Category Airplanes', dated 19 November, 1997, and FAA 'Draft Issue Paper,' dated 12 November 1997, specify limits for occupant protection criteria for side-facing seats that are additional to those required by FAR 25.562. The memorandum and issue paper introduce requirements for body to body contact, TTI, and lateral pelvic acceleration, which are additional to the existing FAR 25.562 (c) HIC requirement. The specific condition,

limitation and measurement are required during the side-facing seat tests. The issue paper also requires that a side-facing seat tested to these requirements and meeting TSO C127a may only be installed in an aircraft by exemption to FAR 25.785 (b).

“The Galaxy aircraft is a twin-jet executive transport with a maximum take-off weight of 34,850 pounds and maximum landing weight of 28,000 pounds. FAA certification was obtained in December 1998. The certification basis of Galaxy is FAR 25 Amendment 82. The Galaxy aircraft model is most often utilized for executive air transportation under parts 91 and 135 of the FAR. The special purpose for this model is to ‘privately’ transport small numbers of employees, corporate executives, potential clients, and/or VIP passengers on business or pleasure trips." In order to provide specific needs for the owner and operator of the private transport, a corporate/executive version of the interior layout is required to be installed into the aircraft. "An example of typical floor plan is enclosed herein. [available in the docket] The importance of the intended 'private' use for these aircraft should not be understated in this Petition for Exemption. An increasing number of companies rely on the use of their private corporate aircraft to enhance convenience, comfort, performance, and efficiency of employees, corporate executives, and interaction with important clients, during the course of business. As a consequence of the above, the layout of the aircraft plays a significant role in the usage to which it can be put. Side facing seating, for both single and multiple occupants, are often required to accommodate the needs of the end user.

“STATEMENT OF ISSUE:

“The pass/fail of the injury criteria developed in Amendment 25-64 focused primarily on the forward facing seats. The side-facing seat installations were not adequately taken into account for transport category airplanes when Amendment 25-64 was promulgated. The FAA has determined that the existing regulations do not provide adequate or appropriate safety standards for occupants of side-facing multiple occupant seats (divans). Additionally, the best criteria currently available for evaluation of this type of seating do not ensure a level of safety that is equivalent to that afforded to occupants of forward and aft facing seating. Therefore, the only certification method available for this type of seating, for aircraft that include Amendment 25-64 in their certification basis, is through an exemption from the general injury requirements of 25.785(b).

“This petition for exemption presents a description of the proposed side facing seating (ERDA Model 4403), the proposed test criteria, a proposed test outline, a statement of public interest and a petition for relief from the 120 day notice requirement. This petition also requests an exception to publication of summary and relief from 120 day notice requirement.

“DESCRIPTION OF PROPOSED SEAT:

“The seat forms part of a modular concept to provide multiple occupant side facing divan style seating for the Galaxy aircraft. Each module is designed for a single occupant. These modules can be installed to provide multiple occupant side facing seating in any layout required by the end user. Upon installation a number of the side facing modules will be connected with a frangible link, breakage of which allows each module to function as a single unit. The link consists of a thin aluminum plate that is attached to adjacent units with Velcro. The spacing between the modules will be determined during the dynamic test by measurement of the permanent deformations experienced by the module after the test. This spacing, and the frangible link ensures that adjacent modules in a multiple occupant seating configuration are not subject to pre-load and that the energy absorbing features of individual modules are allowed to function correctly, thereby reducing the loads experienced by the occupant. It also justifies each module being classed as a single unit with no structural interaction between modules.

“The side facing unit is designed for a track width of 13.19 inches. Each module can be extended by up to 6.5" at either end using non-structural extensions to the berthing top. This allows the maximum flexibility to the interior designer. Each module is designed for a single occupant.

“An innovative feature of this seat is the capability of the back to extend in an upward direction to provide a suitable position for the shoulder harness attachment with respect to the occupant. Typically, aircraft divans have low backs, which result in excessive movement of the occupant during the dynamic test, due to the low placement of the shoulder restraint. The correct positioning of the shoulder harness together with optimum placing of the lap restraint anchor points significantly limits the amount of movement experienced by the occupant.

“THE PROPOSED INJURY CRITERIA:

“The following proposed injury criteria and installation/testing guidelines represent the minimum acceptable standard as stated in Reference (4) for exemption from the general occupant injury criteria of § 25.785(b).

"Existing Criteria: All injury protection criteria of § 25.562(c)(1) through (c)(6) apply to the occupants of side facing seating. HIC assessments are required for head contact with the seat and/or adjacent structures.

"Body-to-Body Contact: Contact between the head, pelvis, or shoulder area of one Anthropomorphic Test Dummy (ATD) on the adjacent seated ATD’s is not allowed during the tests conducted in accordance with § 25.562(b)(1) and (b)(2). Incidental

contact of the leg, feet, arms and hand that will not result in incapacitation of the occupants is acceptable. Contact during rebound is allowed.

"Body-to-Wall/furnishing Contact: If the side-facing seats are installed aft of a structure such as an interior wall or furnishing that may contact the pelvis, upper arm, chest, or head of an occupant seated next to the structure, a conservative representation of the structure and its stiffness must be included in the tests.

"Thoracic Trauma: Testing with a Side Impact Dummy (SID), as defined by 49 CFR Part 572, Subpart F, or its equivalent, must be conducted and Thoracic Trauma Index (TTI) injury criteria acquired with the SID must be less than 85, as defined in 49 CFR Part 572, Subpart F. SID TTI data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) Part 571.214, section S6.13.5.

"Pelvis: Pelvic lateral acceleration must not exceed 130g. Pelvic acceleration data must be processed as defined in FMVSS Part 571.214, section S6.13.5.

"Shoulder Strap Loads: Where upper torso straps (shoulder straps) are used for sofa occupants, tension loads in individual straps must not exceed 1,750 pounds. If dual straps are used for restraining the upper torso, the total strap tension loads must not exceed 2,000 pounds.

“THE PROPOSED TEST OUTLINE:

"One longitudinal test, conducted in accordance with the conditions specified in § 25,562(b)(2) will be performed. A SID ATD will be used, with deformed floor and 10 degrees yaw. This test will be used to define an Occupant Movement Envelope (OME) to satisfy the body to body and body to wall/furnishing requirement. Items within the OME must either be examined by further testing or padded with energy absorbing foam in accordance with paragraph (c) in the preceding section.

"For the vertical test, conducted in accordance with the conditions specified in § 25.562(b)(1) will be performed. A Hybrid II ATD will be used.

“PUBLIC INTEREST:

“Galaxy Aerospace Company, LP, is an U.S. company that provides marketing, sales, aircraft completion and product support service of Galaxy aircraft, a new super mid size business aircraft. Galaxy Aerospace and NORDAM Group employs a large staff to design, manufacture, and install executive interiors for the Galaxy aircraft that are

operated by U.S. customers. The owners of business aircraft very often prefer to configure a meeting/rest area by installing side-facing multiple seats. The side-facing multiple seats provide seating capacity for group meetings as well as capability to convert into a comfortable rest area during the course of the flight. The side-facing multiple seats allow augmented flight crews to rest during long haul and/or multiple leg flights and therefore ensuring the highest level of safety.

"Due to the high demand for these corporate aircraft, it is imperative that the petitioner is granted the regulatory relief requested. Failure to achieve this goal will result in a significant loss of income, in both domestic and foreign trade for the United States, the petitioner, and the intended operators of these airplanes. Therefore the stabilizing effect that manufacturer and support of corporate aircraft has on the job market, is significant and definitely in the public interest.

"Galaxy aircraft will never be operated in scheduled service in the executive configuration with side-facing multiple seats installed nor carry average naïve airline passengers. The side-facing multiple seats tested as specified above would not affect the safe operation of an aircraft. Therefore the side-facing multiple seats can have no adverse effect upon the travelling public, nor the public at large.

"Granting this Petition for Exemption is in the public interest as it would permit the efficient transport of employees, corporate executives, important clientele, and Heads of State in an environment that would otherwise be impossible without this relief. It will be demonstrated by the testing and injury criteria proposed in this Petition for Exemption that the transport of these people is safe.

"REQUEST FOR EXEMPTION TO PUBLICATION OF SUMMARY AND RELIEF FROM 120 DAY NOTICE REQUIREMENT:

"The Galaxy Aerospace and NORDAM Group also request this petition to be exempted from publication of summary and public comment procedures as stated in FAR 11.27 (j)(3). The petitioners request this exemption to be granted within 30 days of receipt of the subject Petition by the Transport Aircraft Directorate (TAD). Following is showing of good cause in support of this request:

"This petition for exemption, if granted, would not set a precedent. The petition for exemption and the reasons presented in this petition are identical to the exemptions previously granted. These exemptions are Exemption No. 7120 and 7104. Exemption No. 7120 and 7104 show that the summary of the petition were published in the Federal Register on December 6, 1999 (64 FR 68193) and September 9, 1999 (64 FR 49042) respectively. No public comments were received.

"The requirement for publication of petition summary and public comment would delay the action on the petition. The petitioner will encounter significant economic loss owing to delivery delays and/or contract terminations if not granted the requested relief within 30 days."

The FAA has determined that good cause exists for waiving the requirement for Federal Register publication because the exemption, if granted, would not set a precedent, and any delay in acting on this petition would be detrimental to Galaxy Aerospace.

The Federal Aviation Administration's analysis/summary is as follows:

Background

The applicant's petition for exemption from § 25.785(b) is based on the FAA Memorandum, Side-Facing Seats on Transport Category Airplanes, dated November 19, 1997. This memorandum provides dynamic test condition requirements and pass/fail criteria for side-facing seats on transport category airplanes.

The FAA Memorandum: Side-Facing Seats on Transport Category Airplanes, dated November 19, 1997, provides:

(1) The dynamic test conditions criteria. In terms of both pulse severity and types of tests currently required, these criteria are also considered directly applicable to side-facing seats. While it is true that the regulation was written with forward- and aft-facing seats in mind, the orientation of the seat does not change the relevant test conditions.

(2) The pass/fail criteria. For these criteria, however, the orientation of the seat may be significant. Injury criteria are currently limited to head, spine, and femur loads. Head impact is evaluated for contact experienced by the head against any aircraft interior installations, and the pass/fail criterion is based on the resultant head acceleration considering all axes of head motion. The lumbar spinal load is an axially compressive load that is primarily evaluated during the 14g, 60 degree test. The femur load is also compressive, and actually has not proved to be critical thus far. For a side-facing seat, other injury parameters may predominate such that evaluation of those parameters may be necessary to provide an acceptable level of safety.

The first consideration for a side-facing seat is the isolation of one occupant from another. That is, occupants should not rely on the impact with other occupants to provide energy absorption; body-to-body impacts are considered unacceptable.

The second consideration for a side-facing seat is the retention of occupants in the seat and restraint system. Addressing this concern may necessitate providing a means of restraint for the lower limbs as well as the torso. Failure to limit the forward (in the airplane’s coordinate system) travel of the lower limbs can cause the occupant to come out of the restraint system or produce severe injuries due to the resulting position of the restraint system, and/or twisting (torsional load) of the lower lumbar spinal column.

The third consideration for a side-facing seat is limiting the load in the torso in the lateral direction, where human tolerance differs from that for the forward- or aft-facing directions and where potential injury mechanisms exist. The automotive industry has developed test procedures and occupant injury criteria appropriate for side impact conditions. Their criteria involve limitation of lateral pelvic accelerations and use of the human tolerance parameter "Thoracic Trauma Index," which is defined in 49 CFR § 571.214. Use of the 49 CFR § 572, subpart F, Side Impact Dummy (SID), rather than the 49 CFR § 572, subpart B, Hybrid II Dummy used in the 14 CFR § 25.562 test, is required to evaluate these parameters. This is the best means available, at present, to assess the injury potential of a sideward impact condition. Such an evaluation is considered necessary to provide an acceptable level of safety for these types of seats.

Other potential injury mechanisms appropriate for aircraft seats may exist. However, due to the lack of useful injury criteria for those other potential injury parameters, such as neck loads and lower limb flail, the FAA is not able to specify criteria applicable to those areas at this time. The FAA considers that such criteria may be appropriate, particularly for multiple occupancy installations, and intends to pursue their further development.

For multiple occupancy seating, the best criteria currently available cannot be said to provide an equivalent level of safety for those occupants. Therefore, the only vehicle available for accepting these installations would be through an exemption from the general occupant protection requirements of § 25.785(a) prior to Amendment 25-72, or § 25.785(b) after Amendment 25-72.

The following summary of the criteria from the FAA Memorandum, Side-Facing Seats on Transport Category Airplanes, dated November 19, 1997, provides the basis of the petition for exemption.

1. Proposed Injury Criteria

(a) Existing Criteria: All injury protection criteria of § 25.562(c)(1) through (c)(6) apply to the occupants of side-facing seating. Head injury criteria (HIC) assessments are only required for head contact with the seat and/or adjacent structures.

(b) Body-to-Body Contact: Contact between the head, pelvis, or shoulder area of one seated Anthropomorphic Test Dummy (ATD) on the adjacent seated ATD's is not allowed during the test conducted in accordance with § 25.562(b)(1) and (b)(2). Incidental contact of the legs, feet, arms and hands that will not result in incapacitation of the occupants is acceptable. Contact during rebound is allowed.

(c) Body-to-Wall/Furnishing Contact: If the sofa is installed aft of a structure such as an interior wall or furnishing that may contact the pelvis, upper arm, chest, or head of an occupant seated next to the structure, then a conservative representation of the structure and its stiffness must be included in the tests. The contact surface of this structure must be covered with at least two inches of energy absorbing protective foam, such as ensolite.

(d) Thoracic Trauma: Testing with a Side Impact Dummy (SID), as defined by 49 CFR part 572, subpart F, or its equivalent, must be conducted and Thoracic Trauma Index (TTI) injury criteria acquired with the SID must be less than 85, as defined in 49 CFR part 572, subpart F. Side impact dummy TTI data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) part 571.214, section S6.13.5.

(e) Pelvis: Pelvic lateral acceleration must not exceed 130g. Pelvic acceleration data must be processed as defined in FMVSS part 571.214, section S6.13.5.

(f) Shoulder Strap Loads: Where upper torso straps (shoulder straps) are used for sofa occupants, tension loads in individual straps must not exceed 1,750 pounds. If dual straps are used for restraining the upper torso, the total strap tension loads must not exceed 2,000 pounds.

2. General Guidelines

(a) All side-facing seats require end closures.

(b) All seat positions need to be occupied for the longitudinal tests.

(c) For the longitudinal tests, conducted in accordance with the conditions specified in § 25.562(b)(2), a minimum number of tests will be required as follows:

(1) One test will be required with one SID ATD in the forward most position and Hybrid II ATD(s) in all other positions, with undeformed floor, 10 degrees yaw, and with all lateral supports (armrests/walls).

(2) One test will be required with one SID ATD in the center seat and Hybrid II ATD(s) in all other positions, with deformed floor, 10 degrees yaw, and with all lateral supports (armrests/walls). This could be considered the structural test as well.

(d) For the vertical test, conducted in accordance with the conditions specified in § 25.562(b)(1), Hybrid II ATD's will be used in all seat positions.

The FAA may refine the compliance criteria for multiple occupancy side-facing seating to establish an equivalent level of safety. This may include additional injury criteria related to neck loads or other injury mechanisms. The guidance will be updated accordingly, and the certification of multiple occupancy seating may be processed with special conditions in lieu of exemptions. Therefore, the FAA does not agree with the petitioner's request for exemption for installation of side-facing seats manufactured by ERDA, Inc. in any Israel Aircraft Industries Galaxy (A53NM) model aircraft. The FAA will grant an exemption that will cover airplanes that are manufactured for a specific amount of time. During this time, the FAA may refine the compliance criteria for multiple occupancy side-facing seating.

For the purposes of this petition, the date of manufacture is considered to be the date on which inspection records show that an airplane is in a condition for safe flight. This is not necessarily the date on which the airplane is in conformity with the approved type design, or the date on which a certificate of airworthiness is issued. It could be earlier, but would be no later, than the date on which the first flight of the airplane occurs.

Galaxy Aerospace Company and NORDAM Group has proposed to certify the seat and the body-to-body contact by demonstrating that there is no interaction between individual seat modules. The applicant would need to demonstrate that there is no interaction between individual seats by test. Without this testing the FAA can not accept the Galaxy Aerospace Company and NORDAM Group proposal to test the sofa as individual seat modules. This also applies to the Occupant Movement Envelope.

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest and will not affect the level of safety provided by the regulations. Therefore, pursuant to the authority contained in § 49 U.S.C. §§ 40113 and 44701, delegated to me by the Administrator (14 CFR 11.53), Galaxy Aerospace Company, LP, and NORDAM Group is hereby granted an exemption from the requirements of 14 CFR § 25.785(b) for the general occupant protection requirements for occupants of multiple place side-facing seats that are occupied during takeoff and landing manufactured by ERDA, Inc. in any Israel Aircraft Industries Galaxy (A53NM) model aircraft manufactured prior to January 1, 2004.

The following limitations apply to this exemption:

1. Existing Criteria: All injury protection criteria of § 25.562(c)(1) through (c)(6) apply to the occupants of side-facing seating. The HIC assessments are only required for head contact with the seat and/or adjacent structures.

2. Body-to-Body Contact: Contact between the head, pelvis, or shoulder area of one Anthropomorphic Test Dummy (ATD) on the adjacent seated ATD's is not allowed

during the test conducted in accordance with § 25.562(b)(1) and (b)(2). Incidental contact of the legs, feet, arms and hands that will not result in incapacitation of the occupants is acceptable. Any contact between adjacent ATD's is acceptable during rebound.

3. Body-to-Wall/Furnishing Contact: If the sofa is installed aft of a structure such as an interior wall or furnishing that may contact the pelvis, upper arm, chest, or head of an occupant seated next to the structure, then a conservative representation of the structure and its stiffness must be included in the tests. In most cases, the representation of the structure would be more rigid and have less deflection under load than the actual installation on the airplanes. The contact surface of this structure must be covered with at least two inches of energy absorbing protective foam, such as ensolite.

4. Thoracic Trauma: Thoracic Trauma Index (TTI) injury criteria must be less than 85, as defined in 49 CFR part 572, subpart F. Thoracic trauma index data must be processed as defined in Federal Motor Vehicle Safety Standard (FMVSS) part 571.214, section S6.13.5.

5. Pelvis: Pelvic lateral acceleration must not exceed 130g. Pelvic acceleration data must be processed as defined in FMVSS part 571.214, section S6.13.5.

6. Shoulder Strap Loads: Where upper torso straps (shoulder straps) are used for sofa occupants, tension loads in individual straps must not exceed 1,750 pounds. If dual straps are used for restraining the upper torso, the total strap tension loads must not exceed 2,000 pounds.

7. Seat Positions: All seat positions need to be occupied by ATD's for the longitudinal tests.

8. End Closures: All side-facing seats require end closures or other means to prevent the occupant from translating off of the seat.

9. Longitudinal Tests: For the longitudinal tests conducted in accordance with the conditions specified in § 25.562(b)(2), a minimum number of tests will be required as follows:

a. One test will be required with ATD's in all positions, with undeformed floor, 10 degrees yaw, and with all lateral supports (armrests/walls). For configurations with a wall or bulkhead immediately forward of the forward seat position on the sofa, a SID ATD will be used in the forward seat position and a Hybrid II ATD(s) or equivalent will

be used for all other seat locations. For configurations without a wall or bulkhead immediately forward of the forward seat, Hybrid II ATD's or equivalent will be used in all seat locations.

b. One test will be required with Hybrid II ATD's or equivalent in all positions, with deformed floor, 10 degrees yaw, and with all lateral supports (armrests/walls). This could be considered the structural test as well.

10. Vertical Test: For the vertical test, conducted in accordance with the conditions specified in § 25.562(b)(1), Hybrid II ATD's or equivalent will be used in all seat positions.

Issued in Renton Washington, on August 2, 2000.

/s/ Vi L. Lipski
Vi L. Lipski
Acting Manager
Transport Airplane Directorate
Aircraft Certification Service, ANM-100